Zootaxa 1018: 15–46 (2005)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

1018

A review of the Scleractinia (Cnidaria: Anthozoa) of Chile, with the description of two new species

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Abstract

All records of the 23 scleractinian species known to occur off Chile are reviewed, including the first records of seven for this coastline. Two species are described as new: *Caryophyllia huinayensis* and *Tethocyathus endesa*. Additional specimens of 15 of the 23 species are reported. All Chilean species are azooxanthellate, some occurring as deep as 4195 m; only six species occur at SCUBA depth. Three species are reported for the Juan Fernández Islands. The Chilean scleractinian fauna is considered to be depauperate, consisting of only 3% of the known azooxanthellate species.

Key words: Cnidaria, Scleractinia, azooxanthellate corals, Chile, Juan Fernández, new species

Introduction

Although the northwestern coast of Chile extends well into tropical latitudes, the northern flowing Humboldt Current extends the warm temperate realm (Briggs 1974) as far north as 3° S, such that Chile has no tropical coast and thus no tropical zooxanthellate Scleractinia. However, approximately half (669 species) of the known Scleractinia worldwide are azooxanthellate, cold-water species (Cairns 1999), and 23 of these azooxanthellate species are known from the coasts of Chile.

The first scleractinian corals reported from Chile were *Bathycyathus chilensis* and *B. indicus* by Milne Edwards & Haime (1848) from Juan Fernández Islands, the two species later synonymized by Wells (1936). Gay (1854), as well as Philippi (1892), discussed this species, but did not give additional records. As a result of 20 stations made by the *Challenger* expedition in late 1875 to early 1876 (stations 294–313), Moseley (1881) added

Accepted by Z.-Q. Zhang: 24 May 2005; published: 15 Jul. 2005

five deep-water species to the Chilean fauna, one of which, *Caryophyllia clavus* var. *smithi*, forms the basis for *Caryophyllia huinayensis* described herein. Except for a report of several azooxanthellate Tertiary species by Philippi (1887), there were no publications on corals from Chile until Gardiner (1939) listed *Sphenotrochus intermedius* from off Cape Horn, a species later described as a new species: *S. gardineri* Squires, 1961. Later, Squires (1969) published four distributional maps of the Antarctic coral fauna, including some new records off southern Chile, such as *Sphenotrochus gardineri, Solenosmilia variabilis*, and *B. malouinensis*, but did not document any of his records. Keller (1976) reported *Fungiacyathus pseudostephanus* and *Deltocyathus parvulus* (Keller, 1982) from abyssal depths off northern Chile, and *Fungiacyathus pliciseptus* (Keller, 1981) from Sala y Gomez Ridge far off the Chilean coast. In his review of the Antarctic Scleractinia, Cairns (1982) reported 10 scleractinian species from the cold temperate region of Chile, including additions to the Chilean fauna of: *Bathelia candida, Caryophyllia squiresi*, and *Truncatoflabellum truncum*. In her Master's thesis, Piñón (1999) listed the eastern Pacific ahermatypic scleractinian species, which included reference to most of the Chilean species, but did not include new records. Most recently, I (Cairns 2003) described a Late Miocene azooxanthellate from Chile and in the same volume Försterra and Häussermann (2003) reported *Desmophyllum dianthus* and two undescribed species from southern Chilean fjords, the latter of which are described in this report.

This review adds seven species to the Chilean coral fauna (Table 1, *): two new species, two species identified only to genus level, and three species new to Chile but previously known from elsewhere. Additional records of 15 of the 23 species now known from Chile are documented in this report (Table 1, +).

TABLE 1.—The 23 scleractinian species known from Chile (* first records for Chile; + additional records for Chile)

Suborder Fungiina
Family Fungiacyathidae
Fungiacyathus (B.) marenzelleri (Vaughan, 1906)
=*F. symmetricus* sensu Moseley, 1881 and Squires, 1969
F. (B.) pliciseptus Keller, 1981
+*F. (B.) pseudostephanus* Keller, 1976
Family Micrabaciidae
Leptopenus hypocoelus Moseley, 1881
Suborder Faviina
Family Rhizangiidae
*+*Astrangia* sp.
*+*Culicia stellata* Dana, 1846
Family Oculinidae
Bathelia candida Moseley, 1881
*+Madrepora oculata Linnaeus, 1758

.....continued on the next page

TABLE 1 (continued)

Suborder Caryophylliina
  Family Caryophylliidae
    +*Bathycyathus chilensis* Milne Edwards & Haime, 1848
      =*B. indicus* Milne Edwards & Haime, 1848
    *+*C. huinayensis*, n. sp.
      =*Caryophyllia clavus* var. *smithi* sensu Moseley, 1881
    *+*C. diomedeae* Marenzeller, 1904
    *+*C*. sp. cf. *C. quadragenaria* Alcock, 1902
    Caryophyllia squiresi Cairns, 1982
    *+*Tethocyathus endesa*, n. sp.
    +*Deltocyathus parvulus* Keller, 1982
    +*Desmophyllum dianthus* (Esper, 1794)
      =*D. ingens* of Moseley, 1881 and others
    +*Solenosmilia variabilis* Duncan, 1873
  Family Turbinoliidae
    Sphenotrochus gardineri Squires, 1961
  Family Flabellidae
    +*Flabellum (F). curvatum* Moseley, 1881
    +*F. (U.) apertum* Moseley, 1876
      =*F. patagonichum* Moseley, 1881
    Truncatoflabellum truncum Cairns, 1982
    Javania cailleti (Duchassaing & Michelotti, 1864)
Suborder Dendrophylliina
  Family Dendrophylliidae
+*Balanophyllia malouiensis* Squires, 1961

TABLE 2.—Distribution and depth range of the Chilean Scleractinia (E = endemic to Chile).

	Tropical Eastern Pacific	Warm Temperate Peru/Chile	Warm Temperate Juan Fernández	Cold Temperate	Wide-spread	Depth (m) for Chile
F. marenzelleri	x	x			x	2514–3639
F. pseudostephanus		x			x	3840
F. pliciseptatus		E				480
L. hypocoelus		E				3949
Astrangia sp.			x			shallow
C. stellata	x		x		x	0–12
B. candida				x		1146
M. oculata	x	x			x	2000–2500
B. chilensis		E	E			26–420

Even restricting the field to azooxanthellate Scleractinia, the Chilean coral fauna must still be considered to be depauperate. Of the approximately 700 known azooxanthellate

species (Cairns 1999), only 21, or 3%, occur off the long coast of Chile. Of those, only four are endemic to the country (Table 2). The vast majority of Chilean species are deep water in occurrence, only six of the 23 species occurring in waters of SCUBA depth (Table 2), and eight occurring 1500 m or deeper, including one as deep as 4195 m. Geographically, ten species occur in the warm temperate region of Chile, the southern border defined by Briggs (1974) as extending to 41° S, and 12 occur in the cold temperate region. Of the 12 warm temperate species, three occur in shallow water off Juan Fernández Islands and ten occur off the Chilean continental shelf, slope and abyssal plain, rarely in shallow water. Only one species, *B. chilensis*, occurs at both Juan Fernández Islands and off the mainland. Of the 12 cold temperate species, most occur at lower shelf and slope depths, or at unusually shallow depths possibly due to upwelling in the fjord region, e.g., *Desmophyllum dianthus*. Four species (*C. squiresi, S. gardineri, F. curvatum, B. malouinensis*) are present only off the southern tip of Chile near Cape Horn, their center of distribution being off Tierra del Fuego and the Falkland Islands. Half of the Chilean species are widespread in other regions of the Pacific, four of which might be considered to be cosmopolitan.

Material and methods

This review purports to list all records of all living scleractinian species known to occur in Chilean waters, including the Juan Fernández and San Félix Islands, and abyssal ridges and seamounts off the Chilean coast, but not Easter Island. Fossil species are not included. Only those species new to Chile or of special interest are illustrated; otherwise references are given to more complete descriptions and illustrations. Most of the newly reported specimens originate from two cruises of the R/V *Anton Bruun* (cruise 12 in 1965 and cruise 17 in 1966), a Chilean fisheries expedition of the *Akebono Maru* in November of 1978, and collections made by the junior authors in the fjord region (1997–2005). Most of the specimens are deposited at the NMNH; however, most of the *Akebono Maru* specimens are at the MNHNS, and holotypes of the new species are deposited at the ZSM.

Abbreviations used in the text include: CD — Calicular Diameter; GCD — Greater Calicular Diameter; GCD:LCD — Ratio of greater to lesser calicular diameters; IZUA — Instituto de Zoología de la Univesidad Austral de Chile; MNHNS — Museo Nacional de Historia Natural, Santiago, Chile; MZUC — Museo de Zoología de la Universidad de Concepción; NMNH — National Museum of Natural History, Smithsonian, Washington, D. C.; PD:GCD — Ratio of pedicel diameter to greater calicular diameter; Px, Sx — Pali or septa, respectively of cycle designated by the numerical subscript; RMNH — Nationaal Natuurhistorisch Museum, Leiden; Sx>Sy — Septa of cycle x broader than those of cycle y; UCCC — Universidad de Concepción Colecciones Científicas; USNM — United States National Museum, now the National Museum of Natural History, Smithsonian, Washington, D. C.; ZSM — Zoologische Staatssammlung München.

Fungiacyathus (B.) marenzelleri (Vaughan, 1906)

Bathyactis symmetrica. —Moseley, 1881: 186–190 (in part: *Challenger* 299), pl. 11, figs. 1–5.
Bathyactis marenzelleri. Vaughan, 1906: 66, pl. 4, figs. 1a–b.
Fungiacyathus symmetricus. —Squires, 1969: 17, pl. 6, map 2. —Cairns, 1982: 5–7, pl. 1, figs. 1–2, 8, map 1); 1994: 15–16, pl. 1a–f (synonymy, description). —Piñón, 1999: 19, 79 (listed).

Remarks. —*Fungiacyathus marenzelleri* is known from only two records off Chile: the abyssal plain off Valparaiso (33°S) at 2514 m (Moseley 1881 as *B. symmetricus* from *Challenger* 299) and the Chile Rise off Valdivia (41°S) at 3639 m (Cairns 1982). It is also known from many localities in the eastern Pacific from Peru to the Aleutian Islands, summarized by Cairns (1994). It is the deepest living scleractinian known, having a bathymetric range of 300–6328 m (Cairns 1982, Keller 1976) and is cosmopolitan in distribution. It is a free-living, discoidal, extremely fragile solitary coral having 48 septa, all of which are obscured with abundant tissue when the coral is alive. The species is adequately described and illustrated by Cairns (1982, 1995).

Fungiacyathus (B.) pliciseptus Keller, 1981

Fungiacyathus pliciseptus Keller, 1981: 34–35, pl. 2, fig. 3.

Remarks. —This species is known only from the 4 specimen type series collected from Sala y Gomez Ridge at 480 m. Although considerably off the coast of northwestern Chile, it is included for completeness.

Fungiacyathus (B.) pseudostephanus Keller, 1976
Figs. 1A—B

Fungiacyathus pseudostephana (sic). Keller, 1976: 34–35, pl. 1, figs. 3–5, map.
Fungiacyathus pseudostephanus. —Piñón, 1999: 19, 79 (listed).

New Record. —*Vema* 17-1, 7°10'S, 85°50'W, 4124 m, 26 Feb 1961, 1 corallum, USNM 80120.

Remarks. —The type locality of this species is several km west of Antofagasta, Chile (23°19'S, 70°57'W), but at a depth of 3840 m. It is also reputed to occur in the central Indian Ocean at depths of 3880–5120 m, making it one of the deepest living scleractinian corals known (Keller 1976). The specimen reported herein is the second report of the species, collected from the abyssal plain off Chiclayo, Peru at 4124 m. It is 17.3 mm in CD

and 8.3 mm in height, having highly ridged and serrate costae and a moderately conical base. The corallum has 48 septa, the S1 consisting of 4–5 tall axial lobes and an outer lobe consisting of 13–25 trabeculae. S2 consist of 7–8 axial lobes and an outer lobe consisting of 5–7 trabeculae.

Leptopenus hypocoelus Moseley, 1881

Leptopenus hypocoelus. Moseley, 1881: 208, pl. 14, figs. 5–6. —Cairns, 1977: 88–89, figures. —Keller, 1977: fig. 1. —Piñón, 1999: 19, 79 (listed). —Bonilla & Pinon, 2002: 38 (listed).

Remarks. —This species is known from only one specimen, the holotype, collected at *Challenger* 299: 33°31'S, 74°43'W (off Valparaiso, Chile) at 3949 m. The specimen is glued to a glass slide and deposited at the British Museum. It is arguably the most delicate and beautiful coral skeleton of all Scleractinia, the genus name, *Leptopenus*, literally translating to "delicate web". The species has been described only by Moseley (1881), but was subsequently illustrated by Cairns (1977). It is among the deepest living scleractinian corals and certainly one of the rarest in the order.

Astrangia sp.

Fig. 1C

New Record. —Juan Fernández Islands, Chile, depth unknown, Dec 1926, 1 colony of 18 corallites, USNM 1021962.

Remarks. —This is the first record of *Astrangia* from Chile, although its occurrence here is not unexpected, as the shallow-water rhizangiids, including *Astrangia, Culicia*, and *Oulangia*, are the most common type of Scleractinia in the shallow-water tropical and warm temperate eastern Pacific (see Durham & Barnard 1952, Cairns 1994). The taxonomy of the eastern Pacific *Astrangia* is extremely confused (Cairns 1994) and thus no attempt is made to identify this single corallum, however an illustration and short description is provided below. Another specimen of *Astrangia*, consisting of about 20 corallites was collected at Cumberland Bay, Isla Róbinson Crusoe at an unknown depth in 1894. It is deposited at the Zoologisches Museum Berlin (5657) pers. comm. (H. Zibrowius 2004).

The specimen reported herein consists of 18 corallites encrusting a small rock 2.8 cm in width. The largest and best preserved corallite is 4.0 x 3.8 mm in CD and 5.3 mm in height. Corallites are light brown and have low, granular costae. The septal complement of the largest corallite is 8:8:16, resulting in 32 septa. The fossa is fairly deep and all septa bear several elongate teeth on their lower axial margins.

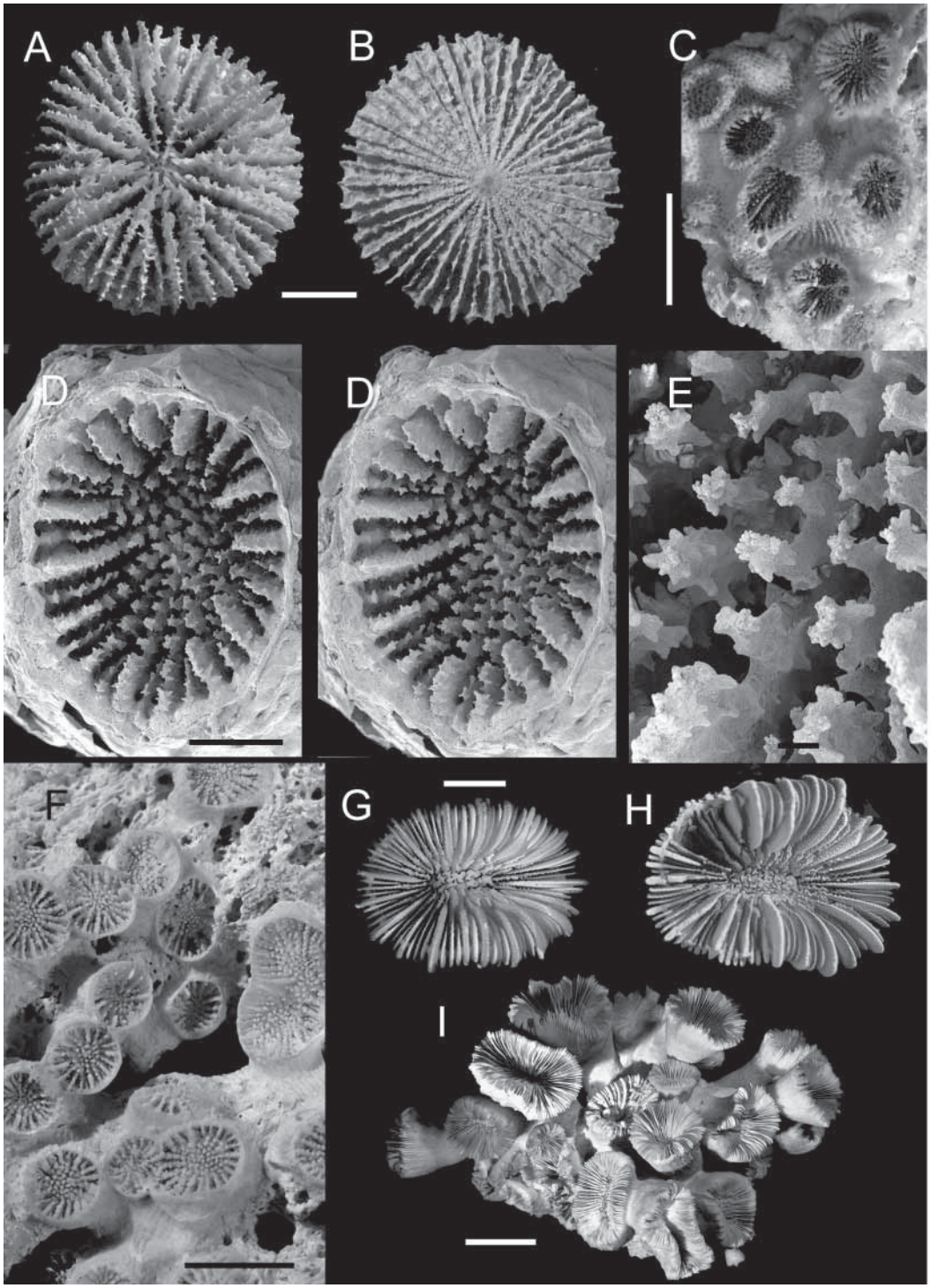

FIGURE 1. A–B, *Fungiacyathus pseudostephanus*, USNM 80120, calicular and basal views, both x 2.3; C, *Astrangia* sp., USNM 1021962, x 3.4; D–E, *Culicia stellata*, USNM 1021978, stereo view of calice and detail of axial septal teeth, x 14, x 63, respectively; F, *Culicia truncata*, holotype, USNM 183, x 3.5; G–I, *Bathycyathus chilensis* (G, USNM 100707; H, USNM 100708; I, USNM 100711): G–H, calicular views, both x 1.9; I, colony, x 0.53. Scale bars for A–C, F–H = 5 mm; D = 1 mm; E = 0.1 mm; I = 2 cm.

Culicia stellata Dana, 1846

Figs. 1D–E

Culicia stellata Dana, 1846: 377, pl. 28, figs. 5a–d. —Cairns & Zibrowius, 1997: 78–79, figs. 3a–b (synonymy).
Culicia truncata Dana, 1846: 378, pl. 28, figs. 7, 7a.
Culicia japonica Yabe & Eguchi, 1936: 167–168, figs. 1–3.
Culicia rubeola. —Chevalier, 1971: 93–100, pl. 3, fig. 6.
Culicia sp. cf. *C. rubeola*. —Cairns, 1991: 7, pl. 1i–j (Galápagos, Cocos Islands).

New Records. —*Anton Bruun* 12-65235, 33°38'20"S, 78°48'50"W (Róbinson Crusoe Island, Juan Fernández Islands), 3–12 m, 11 Dec 1965, 1 small cluster of about 20 corallites, USNM 1021964; *Anton Bruun* 12-65239, 33°38'20"S, 78°49'00"W, 2–8 m, 11 Dec 1965, several dozen corallites on 3 small rocks, USNM 1021966; *Anton Bruun* 12-65243, 33°37'00"S, 78°50'50"W, 0–10 m, 12 Dec 1965, several dozen corallites on 6 small rocks, USNM 1021978; *Eltanin* 21-200, east coast Roca Más Afuera, Isla San Ambrosio, intertidal, 26 Nov 1965, 4 corallites, USNM 1021979.

Remarks. —These are the first records of *C. stellata* from off Chile, specifically from Juan Fernández and San Ambrosio Islands (0–12 m), although it is common in the western Pacific (see Cairns & Zibrowius 1997) and previously reported from the eastern Pacific (Galápagos, Cocos Islands) by Cairns (1991) as *Culicia* sp. cf. *C. rubeola*. The Chilean corallites are rarely over 3.5 mm in GCD and 3 mm in height (GCD:LCD = 1.14–1.18), having a strongly epithecate wall and white in colour. Corallites stand 1–5 mm apart, linked by ribbon-like stolons that are often encrusted with epiphytes. Distomodeal intratentacular budding occurs occasionally. Septa are hexamerally arranged in four incomplete cycles (S1>S2>S3>S4), the larger corallites commonly having 30, 32, or 34 septa, corresponding to the presence of 3, 4, or 5 pairs of S4. S1 consist of an upper lobe and 1–3 elongate, lower axial teeth. S2 and S3 are only slightly smaller and sometimes hard to distinguish from the S1, but have a smaller upper lobe and more lower axial teeth. S4 are rudimentary, consisting of a series of 5–7 slender, horizontal teeth. The septal teeth grade imperceptibly into the columellar elements.

The Chilean populations correspond to the '*truncata*' form of the species (Fig. 1F), the corallites of which are rarely over 3 mm in height and have stolons strongly encrusted between corallites.

Bathelia candida Moseley, 1881

Bathelia candida Moseley, 1881: 177–178, pl. 8, figs. 1–6. —Cairns, 1982: 13, pl. 3, figs. 1–3, map 1. —Piñón, 1999: 20, 80 (listed).

Remarks. —This species is known from only one record off Chile: 47°01'S, 75°44'W (off Península Tres Montes) at 1146 m, although additional specimens are known from off southern South America from Rio Grande, Brazil to Cabo Tres Puntas, Argentina at depths

of 500–1250 m (Cairns 1982). It is characterized as having a colony with large (up to 1 cm in CD) sympodially arranged corallites, a fascicular columella, four cycles of septa and one crown of 12 P3, and occasionally intratentacular budding.

Madrepora oculata Linnaeus, 1758

Madrepora oculata Linnaeus, 1758: 798. —Cairns, 1982: 15, pl. 3, figs. 4–6 (synonymy and South American records).

New Record. —off Valdivia (39°59'S; 73°43'W), between 2000 and 2500 m, collected in 1994, IZUA-CNI-0009.

Remarks. —This is one of the approximately dozen cosmopolitan species of deep-water scleractinian corals; however, only one specimen is known from off Chile. It was also reported from the Drake Passage by Cairns (1982).

Bathycyathus chilensis Milne Edwards & Haime, 1848

Figs. 1G–H

Bathycyathus chilensis Milne Edwards & Haime, 1848: 294–295, pl. 9, fig. 5; Gay, 1854: 454–455. — Milne Edwards & Haime, 1857: 23. —Verrill, 1870: 539 (English translation of description of Milne Edwards & Haime, 1848). —Philippi, 1892: 8–9, pl. 2, figs. 3a–c. —Wells, 1936: 102–103. —Andrade, 1987: 78 (listed). —Piñón, 1999: 20, 80 (listed).
Bathycyathus Indicus Milne Edwards & Haime, 1848: 295, pl. 9, fig. 4; 1857: 23.

New Records. —*Anton Bruun* 12-MV65IV58 (33°38.2'S, 78°56.6'W), Isla Róbinson Crusoe, depth unknown, 14 Dec 1965, 8 corallites, USNM 100706; *Anton Bruun* 12-MV65IV63 (33°41.2'S, 78°57'W), depth unknown, 15 Dec 1965, 8 corallites, USNM 100707; *Anton Bruun* 12-135 (33°34.3°S, 78°54.9'W), 160–180 m, 14 Dec 1965, 26 corallites, USNM 100708; *Anton Bruun* 12-MV65IV47 (33°37.5'S, 78°40.7'W), depth unknown, 12 Dec 1965, 3 corallites, USNM 100709; *Anton Bruun* 12-65240 (33°37'18"S, 78°50'20"W), 26–29 m, 12 Dec 1965, 3 corallites, USNM 100710; *Anton Bruun* 12-MV65IV45 (33°37'S, 78°50'50"W), depth unknown, 12 Dec 1965, 1 dead corallite, USNM 1021981; "East side of Juan Fernández Islands", depth unknown, 12 Dec 1926, large colony of 25 corallites, USNM 100711; 32°31'S, 71°36'W (off Papudo, Chile), 420 m, 9 corallites, MNHNS; Juán Fernández Island, 30 m, Dec 2002, large colony of 39 corallites, IZUA-CNI-0050.

Remarks. —*Bathycyathus chilensis* was originally described from one specimen from "Chile" at an unspecified depth, and *B. indicus* was originally reputed to be from the Philippines, but Milne Edwards & Haime (1857) later indicated it was from Juan Fernández Islands at 80 fathoms (=146 m). Wells (1936) made *B. chilensis* the type species of the genus, synonymized *B. indicus* with *B. chilensis*, and indicated that both type specimens were deposited at the Paris Museum. There is only one specific record of *B. chilensis* from

the coast of Chile, reported herein from off Papudo at 420 m. The species is otherwise known only from off Isla Róbinson Crusoe of the Juan Fernández Islands at depths of 26–180 m. As the records reported herein are the only subsequent to its original description, a short description follows.

The largest corallum (USNM 100711) is 13 cm wide and 9 cm tall (Fig. 1I), consisting of about 25 contiguous corallites, all united basally in a common coenosteum. The largest corallite is 31 x 18 mm in CD and 48 mm in height, although the largest calice is 34 mm in GCD. Calices are circular to highly elliptical in outline, with a GCD:LCD ranging from 1 to 3.4, the more elongate calices appearing to be a precursor to distomedial intratentacular budding, although extratentacular budding from the common basal coenosteum is more common. Costae are well developed, ridged, and separated from one another by deep intercostal grooves. The corallum is uniformly white. Septa are hexamerally arranged in five cycles (96 septa), the more elongate calices with pairs of S6 in the end half-systems. Septal formula: S1–2>S3>4>>S5. S1–2, and their adjacent S5, are highly exsert (up to 3 mm), producing a lancetted calicular margin. S5 are quite small. The occurrence of pali and/or paliform lobes is quite variable. Some corallites have 12 distinct, but small, P3 positioned low in the fossa, but most corallites have no indication of P3 at all. P4 are much more common, often forming a crown of 24 discrete P4, but in many corallites the pali are reduced to little more than thickenings of the lower axial edges of the S4. The columella is usually a well-developed, elongate field of fascicular elements sitting low in the fossa, but occasionally it is absent, being crowded out by the lower axial edges of the S1–4.

***Caryophyllia huinayensis*, new species**
Figs. 2A–C, 3A–F, 7

Caryophyllia clavus var. *smithi*. —Moseley, 1881: 134. —Cairns, 1982: 59, pl. 18, figs. 8–9, map 3. —Piñón, 1999: 20 (listed).
Caryophyllia spec. nov. Försterra and Häussermann, 2001: 55; 2003: 119, 121, 126–128 (13 sites from shallow water of southern Chilean fjords).

Material Examined/Types. —Holotype: Caleta Gonzalo, Reñihue Fjord, South Chile (42°32'46,6"S, 72°37'0,2"W), 30 m, 7 Feb 2001, ZSM 20050146. Paratypes: same locality, 1 specimen, ZSM 20050147; same locality, 3 specimens, USNM 1021983; same locality, 23 Feb 1997, 25–35 m, one specimen on *Desmophyllum dianthus*, ZSM 20020241; Lenca, Seno de Reloncaví, South Chile (41°38'20.4'S, 72°40'07.4"W), 27 m, 24–25 Jan 2001, 2 specimens, USNM 1021991; same locality, 27 m, 24–25 Jan 2001, 2 specimens, RMNH Coel. 33207; north shore of Quintupeu fjord (42°09'S; 72°25'W), 23–26 m, Sept 2003, 1 specimen, IZUA-CNI-0056; Challenger 308 (50°08'30"S, 74°41'00"W), 256 m, 5 Jan 1876, 3 specimens, BM 1880.11.25.27.

Type Locality. —Caleta Gonzalo, Reñihue Fjord (42°32'46.6'S, 72°37'00.2"W), South Chile, 30 m.

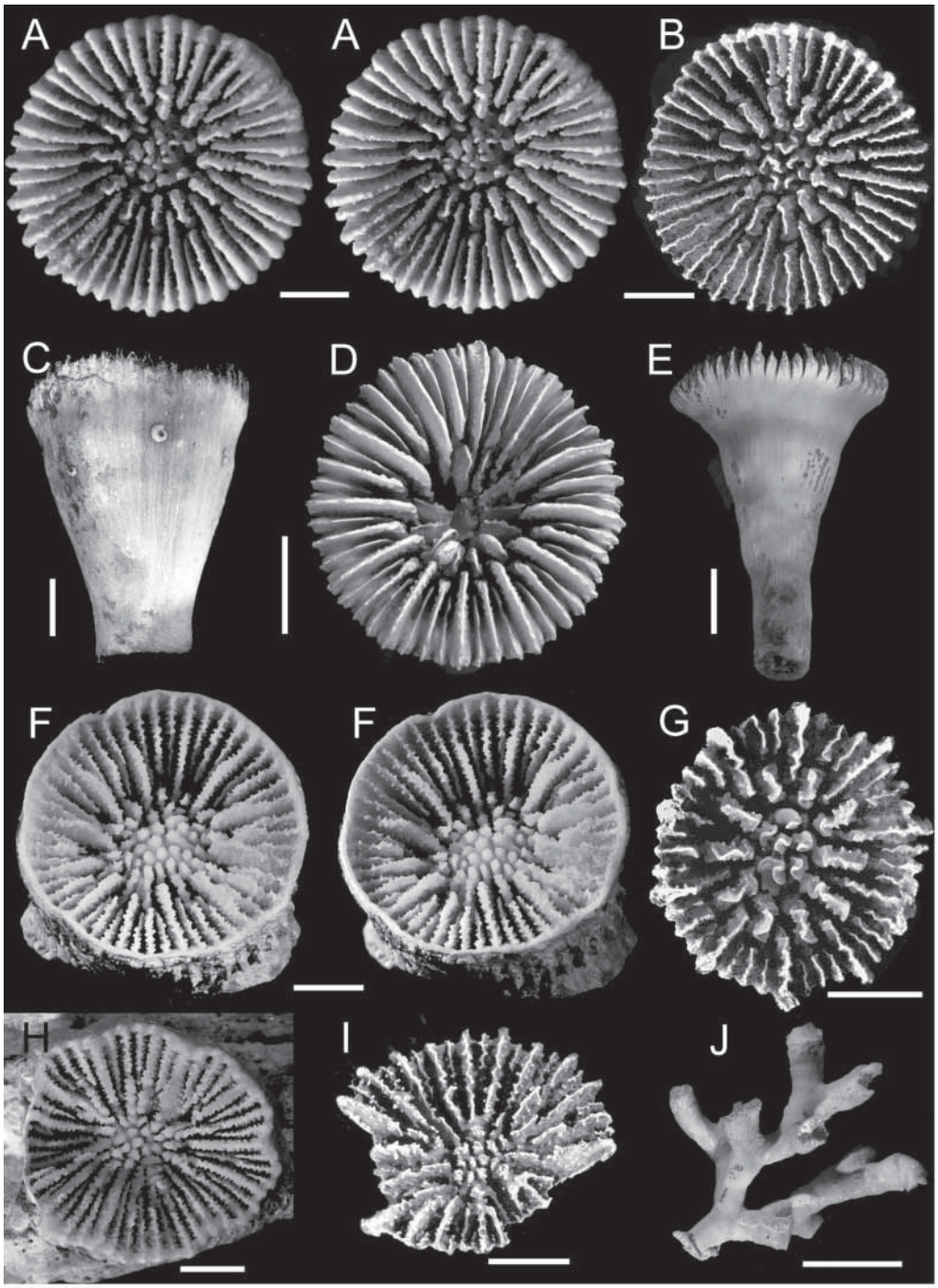

FIGURE 2. A–C, *Caryophyllia huinayensis* (A, paratype, USNM 1021991; B–C, holotype, ZSM 20050146): A, stereo view of calice, x 5.3; B, calicular view, x 5.3; C, lateral view of corallum, x 4.5; D–E, *Caryophyllia diomedeae*, USNM 83522, calicular and lateral views, x 3.0, x 2.0, respectively; F, H, *Tethocyathus endesa* (F, holotype, ZSM 20050148; H, paratype, USNM 1021980): F, stereo calicular view, x 5.2; H, calicular view, x 4.9; G, *Caryophyllia* sp. cf. *C. quadragenaria*, USNM 1021992, calicular view, x 7.3; I, *Deltocyathus parvulus*, USNM 1021993, oblique calicular view, x 6.1; J, *Solenosmilia variabilis*, USNM 1022415, colony fragment, x 0.75. Scale bars for A–C, F–I = 2 mm; D–E = 5 mm; J = 2 cm.

Description. —Corallum ceratoid and attached, the largest specimen (BM 1880.11.25.27) 8.7 x 7.6 mm in CD and 18.7 mm in height, the holotype slightly smaller: 7.9 x 7.5 mm in CD and 10.3 mm in height (broken pedicel). Calice circular to slightly elliptical, the GCD:LCD ranging from 1.02–1.15. Corallum attached by a robust pedicel (PD:GCD = 0.39–0.47). Costae not prominent, the theca being smooth, sometimes porcellaneous, and covered with small, low granules. Theca also often encrusted with bryozoans and serpulids. Corallum uniformly white.

Septa hexamerally arranged in 4 cycles according to the formula: S1–2>S3>S4, although some coralla lack 2 or 4 septa resulting in 44 or 46 septa and 11 pali. Twenty-four septa and 6 pali are present at a CD of 2–3 mm, a full fourth cycle complete at a GCD of 5.5 mm. S1–2 only slightly exsert (0.8 mm), having straight to slightly sinuous axial edges that reach about three-quarters distance to columella. S3 equally exsert, about 70% width of the S1–2, having moderately sinuous axial edges. S4 slightly less exsert, about 80% width of the S3, having straight axial edges. Calicular margin not lancetted. Fossa of moderate depth, containing a circular to slightly elliptical crown of 12 broad pali (P3), each palus about 0.8 mm wide and having highly sinuous edges. Within the palar crown and slightly recessed is a field of 8–14 slender, twisted columellar elements constituting the fascicular columella.

Tissue color pinkish to red orange with the tentacles being more transparent than the tissue of the oral disc, very few specimens with whitish transparent tissue; color appearance may vary slightly due to endolithic algae. Spherulae distinctly pronounced, whitish to orange with color being more intense than in rest of tentacle. Most individuals with 48 tentacles.

Comparisons. —Among the approximately 46 species of attached *Caryophyllia* (many listed by Cairns 1991 and Cairns et al. 1999), *C. huinayensis* is morphologically most similar to *C. cyathus* (Ellis & Solander, 1786), both species having a compact, almost circular palar ring and columella. *C. cyathus*, however, is much larger, often having five full cycles of septa (96 septa and 24 pali) and is known only from the northeast Atlantic at 70–700 m (Zibrowius 1980).

Etymology. —This species is named after the Fundo Huinay in the fjord Comau where most of the examined specimens have been collected. The name is also related to the Huinay Foundation which runs the Huinay Scientific Field Station (HSFS) from which most of the research on this species has been carried out.

Remarks. —Moseley (1881) was the first to report this species from Chile based on three specimens from Canal Aneho, but identified it as a northeast Atlantic species. Cairns (1982) examined and illustrated one of Moseley's three specimens, concluding that they probably represented an undescribed species, but he did not describe it as new because of the paucity of specimens. Now, almost a quarter of a century later, the species is described based on the examination of 24 specimens from considerably shallow water than previously collected.

Habitat and Biology. —The species can generally be found in the Chilean fjords on and below overhanging portions of the substrate in depths greater than 20 m. During our diving surveys we found this species on primary (rock walls, boulder ground) and biogenic hard substratum (shells, other corals, brachiopods) and even on shells of living mollusks (such as the mytilid *Aulacomya atra* and the gastropod *Crepidula* sp.), mainly at overhanging portions and at sites with moderate to strong current. We regularly found this species in the euphotic zone between 20 and 45 m depths in between and on specimens of the species *Desmophyllum dianthus*. Single specimens were found as shallow as 16 m, but always below the regular influence of the low salinity layer. Larger and most shallow accumulations of these corals were found in the fjords Comau (including Quintupeu and Lilihuapi Island) and the fjord Reñihue (S2–4). Highest densities were observed on the lower portion of large rock boulders which were lying on sand ground in the fjord Quintupeu. With an ROV, specimens of *C. huinayensis* could be observed in the fjord Comau down to depth of 200 m. In depth greater than 100 m specimens were regularly seen scattered over near-vertical rock walls. Shallow water habitat temperatures ranged from 8 to 13.5 °C and salinities from 28.5 to 34 l.

The position in the habitat might indicate sensitivity towards sedimentation stress. Several specimens were observed to have larvae or eggs in the tentacles (Fig. 3C).

Associated species. —*Caryophyllia huinayensis* is mostly found on, between, or in close proximity to specimens of *Desmophyllum dianthus* and is a regular, although small, component of the shallow water coral banks in Chilean fjords. *Caryophyllia huinayensis* is slightly more abundant at the edges of these coral aggregations. On the overhanging portion of large boulders that were lying on sand ground in 25 m depth, specimens of *C. huinayensis* were significantly more abundant in the lower most part whereas *D. dianthus* dominated in the uppermost part of the overhanging portion. On the lower part of these boulders "mono-cultures" of *C. huinayensis* were observed to cover several square meters with densities of more than 4000 individuals/m^2. This may indicate that *D. dianthus* can dominate over *C. huinayensis* at well ventilated positions whereas *C. huinayensis* is more competitive at less ventilated positions. We regularly found light-exposed specimens with corallites stained by endolithic algae, which give them a pinkish or less frequently a greenish appearance. In the habitat, *C. huinayensis* was regularly associated with calcified and non-calcified crustose red algae (probably genus *Lithothamnium* or *Lithophyllum*), the serpulid polychaete *Apomatus* sp., the sponges *Geodia magellani*, *Mycale thielei* and *Iophon* sp., the bryozoa *Cellaria malvinensis*, and the gastropod *Crepidula* sp. Close to coral banks larger schools of the scorpaenid fish *Sebastes capensis* were observed. The corals might benefit from being cleaned from covering sediment through the sweeping effect of the movements of this rock cod.

Distribution. —Chilean fjords: Seno de Reloncaví: Punta Chaica/Lenca (S1); Fiordo Comau: numerous localities, including Isla Lilihuapi at the mouth of the fjord (S2); Fiordo Quintupeu (S3); Fiordo Reñihue: several localities (S4); Fjord Pitipalena (S6); Bahía Santo Domingo (S7) (Fig. 7); 16–256 m

***Caryophyllia diomedeae* Marenzeller, 1904**
Figs. 2D–E

Caryophyllia diomedeae Marenzeller, 1904: 79–80, pl. 1, fig. 2. —Cairns, 1991: 11–13, pl. 4c–e (description, figures); 1995: 49–50, pl. 9, figs. a–d (synonymy, description, figures). —Cairns & Zibrowius, 1997: 88–89 (synonymy, diagnosis, key). —Piñón, 1999: 20, 81 (listed). —Cairns, 2004: 277 (synonymy).

New Record. —*Anton Bruun* 17-673G, 21°31'S, 81°31'W (Nazca Ridge off northern Chile), 1760 m, 9 Jul 1966, 2 specimens, USNM 83522.

Remarks. —Compared to the type, the single intact specimen figured herein differs in having a slightly flared and thickened calicular edge and a deeper fossa, although subsequently reported specimens (see synonymy) include this range of variation. The figured specimen is 16.3 x 15.7 mm in CD and 23.4 mm in height, with a slender pedicel diameter of 3.9 mm. It has a full four cycles of septa and 12 P3, as previously described for this species.

C. diomedeae is widely known from the Pacific Ocean from Panama to Tasmania at depths of 225–2200 m (Cairns in press). It was previously reported from the eastern Pacific off Panama at 1043 m (the type locality) by Marenzeller (1904), the Galápagos at 245–806 m by Cairns (1991), and from 0°–31°S at 55–2086 m by Piñón (1999), although the last record was meant to read 0–31° N (Pinon, pers. comm., 2004).

***Caryophyllia* sp. cf. *C. quadragenaria* Alcock, 1902**
Fig. 2G

Caryophyllia quadragenaria Alcock, 1902: 91–92. —Cairns, 1994: 46–47, pl. 20c–h, 41 c–d (description, synonymy, figures); 1995: 45–46, pl. 7 g–h (description, synonym, figures); 1998: 375.

New Record. —*Anton Bruun* 18A-687, 34°07'S, 72°19', 730–750 m, 5 Aug 1966, 1 specimen, USNM 1021992.

Remarks. —One small specimen measuring 6.2 x 5.5 mm in CD and 10.1 mm in height is tentatively assigned to this species, collected on the continental slope off Punta Topocalma. The species is otherwise known only from the western Pacific (Japan to New Zealand and Western Australia) at depths of 54–430 m (Cairns 1998). *C. quadragenaria* is distinctive among the 58 species in the genus by have decameral septal symmetry, tertiary septa that are as large or larger than the secondary septa, and widely spaced septa. This identification is provisional because of the small size of the single specimen at hand and the unusually deep collection.

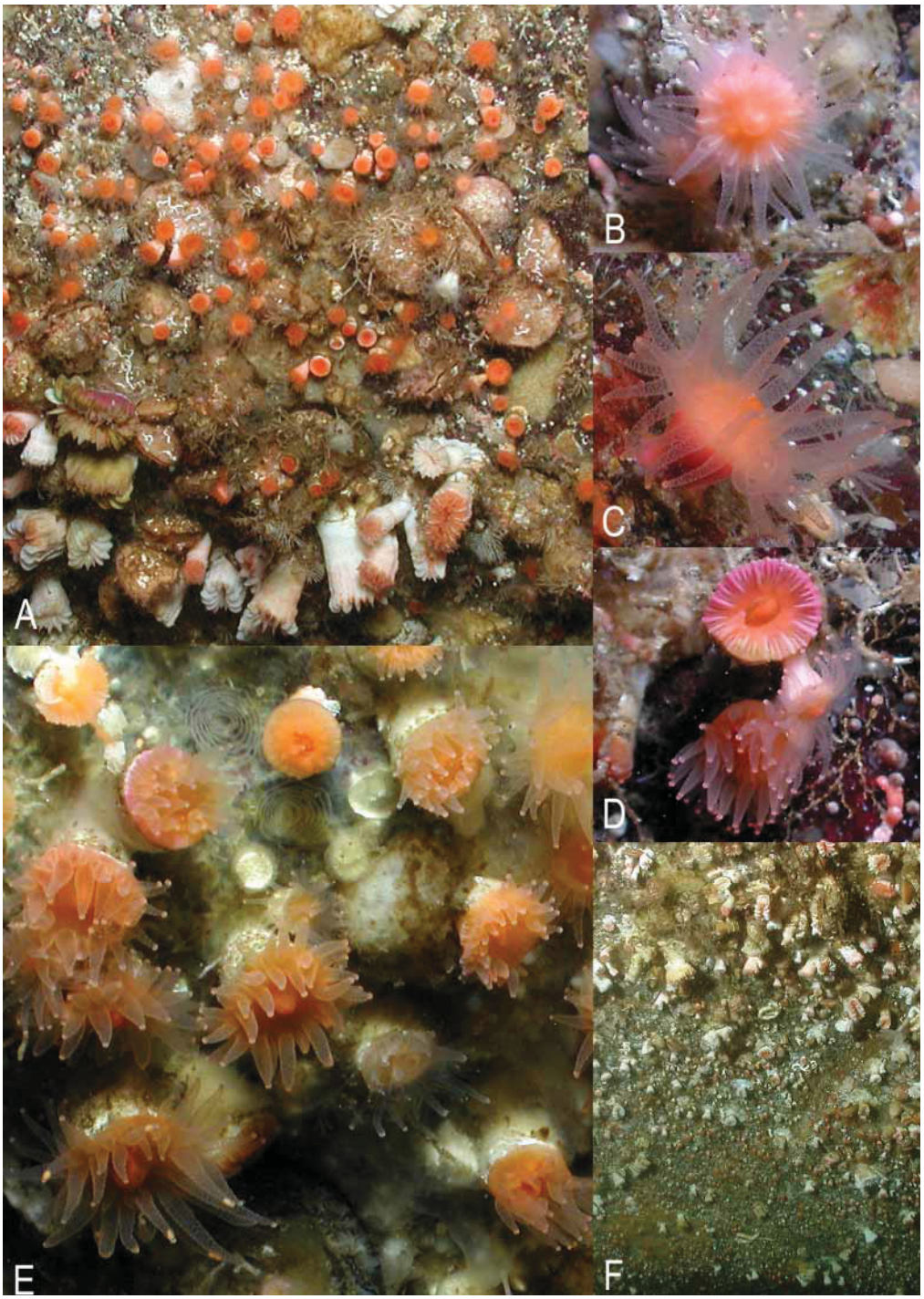

FIGURE 3. *Caryophyllia huinayensis*. Larger specimens on each photo with approximately 8–9 mm LCD. All photos except C from Quintupeu Fjord, 25 m (fig. C from Liliuapi Island, 18 m): A, typical view of a *Caryophyllia* aggregation associated with *Desmopyhllum dianthus* (below); B–D, details of specimens, coralla stained by endolithic algae; E, group of specimens, polyp in lower left corner with larvae or eggs in the tentacles; F, typical habitat sharing of *C. huinayensis* (lower) and *D. dianthus* (upper) on the overhanging portion of a boulder on sandy ground. *Tethocyathus endesa* was found on the same boulder in the non-overhanging portion.

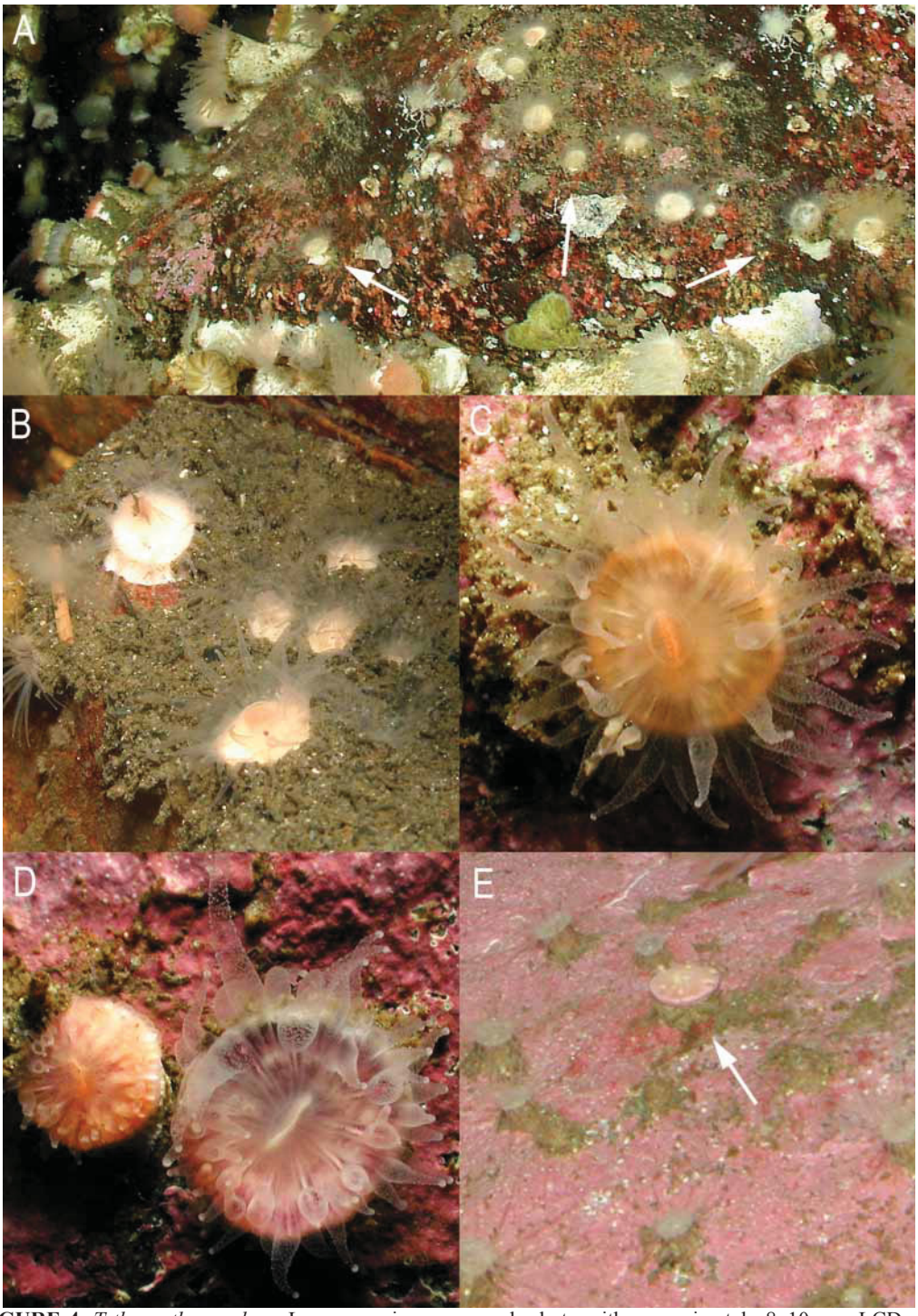

FIGURE 4. *Tethocyathus endesa*. Larger specimens on each photo with approximately 8–10 mm LCD: A, small aggregation in a typical habitat in a gap (arrows show *T. endesa*), surrounded by *Desmophyllum dianthus,* Comau fjord, 25 m; B, group of specimens in thin layer of fine sediment in rock crevice lacking endolithic algae; Comau fjord, 18 m; C–D, specimens differently stained by endolithic algae, C with orange, D with white pharyngeal tissue, Quintupeu Fjord, 25 m; E, typical view of a *Tethocyathus endesa-Epizoanthus* sp.-association, Comau Fjord, 30 m.

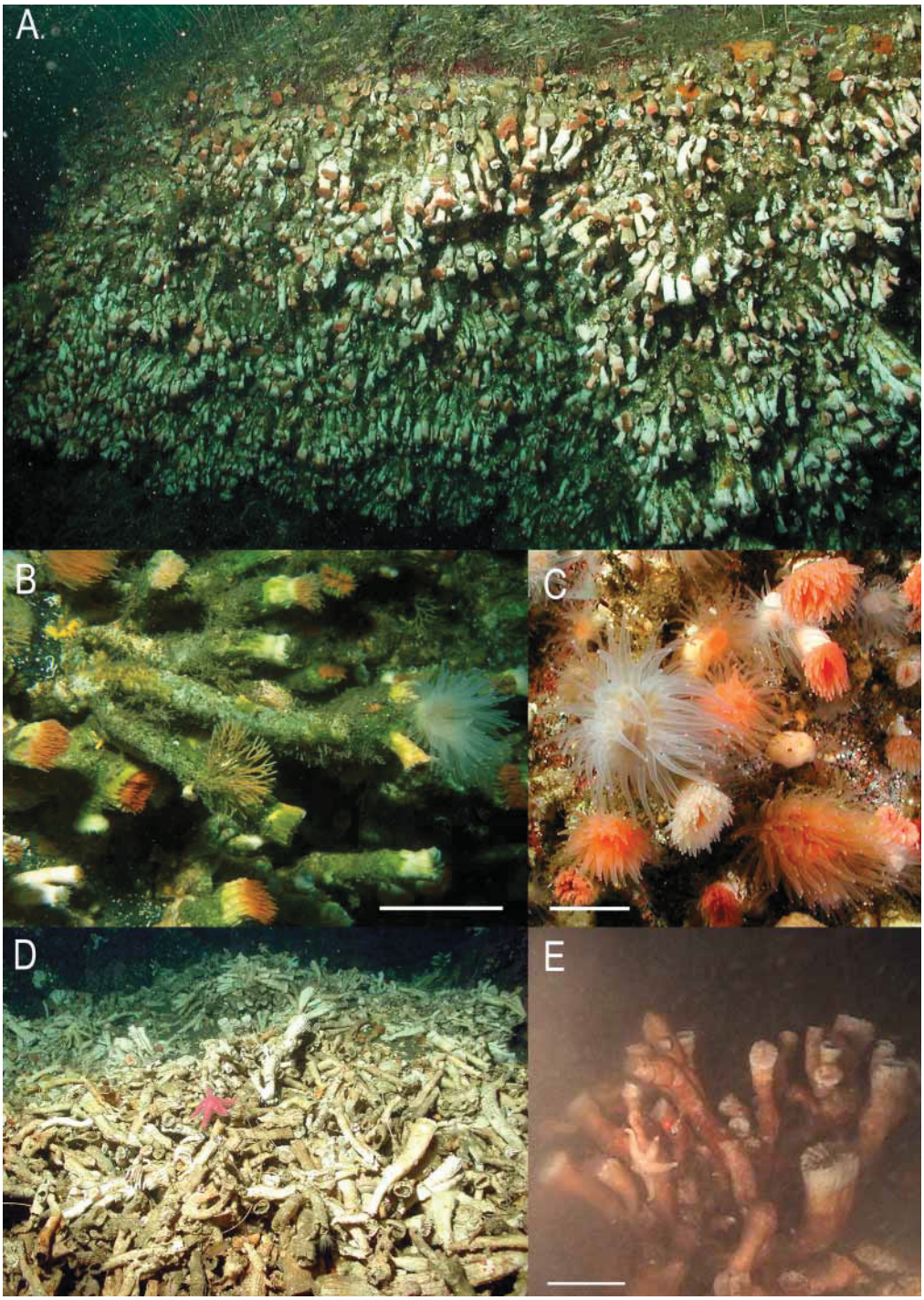

FIGURE 5. *Desmophyllum dianthus* in Chilean fjords: A, a dense coral bank under overhanging portion of a rock wall with more than 1500 individuals/m^2, Comau Fjord, 28 m, width of foreground approx. 4 m; B, elongated specimens in the middle of a large aggregation, with the epizoic bryozoan *Cellaria malvinensis*, Reñihue Fjord, 30 m, scale bar 100 mm; C, specimens exhibiting white and orange tissue colour, Comau Fjord, 25 m. scale bar 20 mm; D, accumulation of coral rubble under coral bank shown in A, width of foreground approx. 1 m, Comau Fjord, 35 m; E, large detached pseudo-colony encrusted with brown iron/manganse compounds, still frame from ROV video, Comau Fjord, 255 m, scale bar 50 mm.

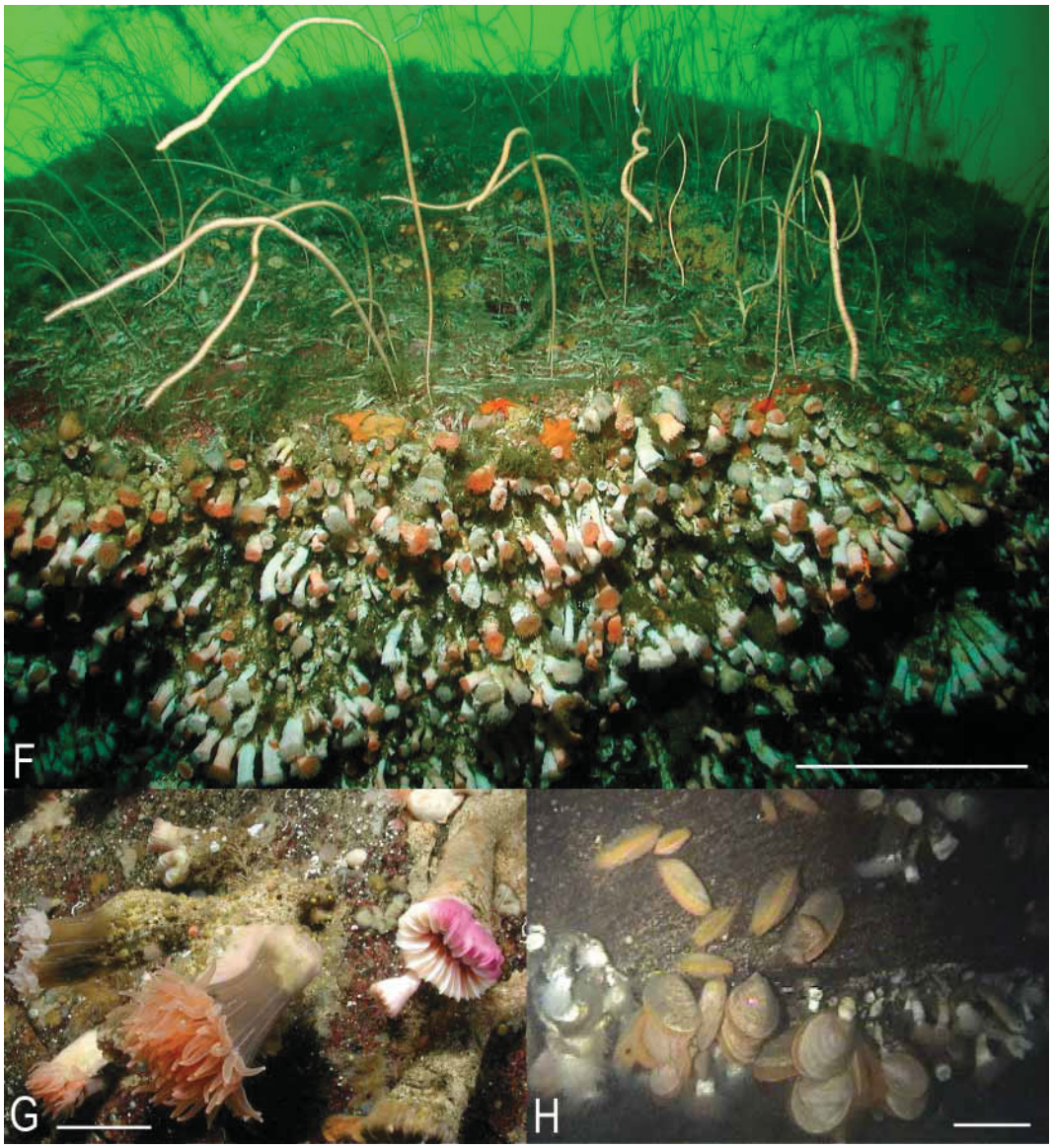

FIGURE 6. *Desmophyllum dianthus*: F, Clear limit between coral bank under overhanging portion of a rock wall and *Primnoella* sp.- dominated community above, Comau Fjord, 25 m, scale bar 0.5 m; G, specimens without (lower left specimens), with brown-green (left specimens) and with pinkish-red (upper right specimen) endolithic algae, left corallite infested with boring sponge of the genus *Cliona*, Comau Fjord, 20 m, scale bar 20 mm; H, corals associated with the clam *Acesta* aff. *patagonica*, still frame from ROV video, Comau Fjord, 150 m, scale bar 100 mm.

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***Caryophyllia squiresi* Cairns, 1982**

Caryophyllia sp. A Squires, 1969: 17, pl. 6, map 1 (in part: 3 of 4 records off South America).
Caryophyllia squiresi Cairns, 1982: 16, pl. 4, figs. 5–9.

Remarks. —This species is known from Chile only off the extreme southern tip of Cape Horn at 406 m: *Vema* 15-PD9 (56°28.1'S, 66°56.4'W), USNM 47517. It is also known from off the Falkland Islands down to 659 m. It is adequately described and figured by Cairns (1982); no additional specimens have been reported since its original description.

***Tethocyathus endesa*, new species**
Figs. 2F, H, 4A–E, 7

Third species (N) —Försterra & Häussermann, 2003: 119, 121, 126–128 (5 sites in shallow water of southern Chilean fjords).

Material Examined/Types. —Holotype: north shore of Quintupeu fjord, South Chile (42°09'S; 72°25'W), 23–26 m, Sept 2003, 1 specimen, ZSM 20050148. Paratypes: same locality, 23–26 m, 13 Feb 2004, 1 specimen, ZSM 20050149; same locality, 23–26 m, 13 Feb 2004, 1 specimen, IZUA-CNI-0057; same locality, 23–26 m, Sept 2003, 2 specimens, RMNH Coel.33208; Caleta Gonzalo, Reñihue Fjord, Chile (42°33'12.7'S, 72°35'22.3'W), 28 m, 23 Feb 2001,1 specimen, USNM 1022414; Caleta Gonzalo, Reñihue Fjord (42°32'46.6'S, 72°37'00.2"W), 30 m, 7 Feb 2001, 1 corallite, ZSM; off Concepción, Central Chile (36°29,9'S; 73°40,8'W), 240 m, July 2003, 3 specimens, MZUC (UCCC) —29548, —29549 and —29550.

Type Locality. —north shore of Quintupeu fjord, South Chile

Description. —Holotype tympanoid, a squat cylinder 8.3 mm in CD and 6.6 mm in height, previously attached to a rock by a polycyclic base. Largest specimen 10.8 x 10.3 mm in calicular diameter and 8.3 mm in height, having 48 septa arranged: 11;11:22:4. First thecal ring of polycyclic base about 0.9 mm in diameter, second 1.4 mm in diameter, and third about 3.2 mm. Costae poorly defined, the theca bearing low granules and covered with a thin tectura; corallum white. Septa hexamerally arranged in 4 cycles according the formula: S1>S2>S4>S3, resulting in 48 septa; however, in the largest specimen the septa are S1=S2>S3>S4. S1 not exsert, their upper outer edges forming a deep and wide depression adjacent to the theca. S1 extend about three-quarters distance to columella, each bearing one vertical rod on its lower axial margin. S2 only slightly smaller than the S1 and of the same shape, each bearing 1–2 vertical rods on their lower axial margin. S3 about three-quarters width of the S2, are not depressed near the theca, each S3 bearing a narrow paliform lobe, obliquely oriented on the lower axial margins. S4 often slightly wider than the S3, but do not have axial lobes. Fossa of moderate depth, containing a papillose columella composed of 20–25 granular rods that are indistinguishable from the lower axial septal lobes and pali.

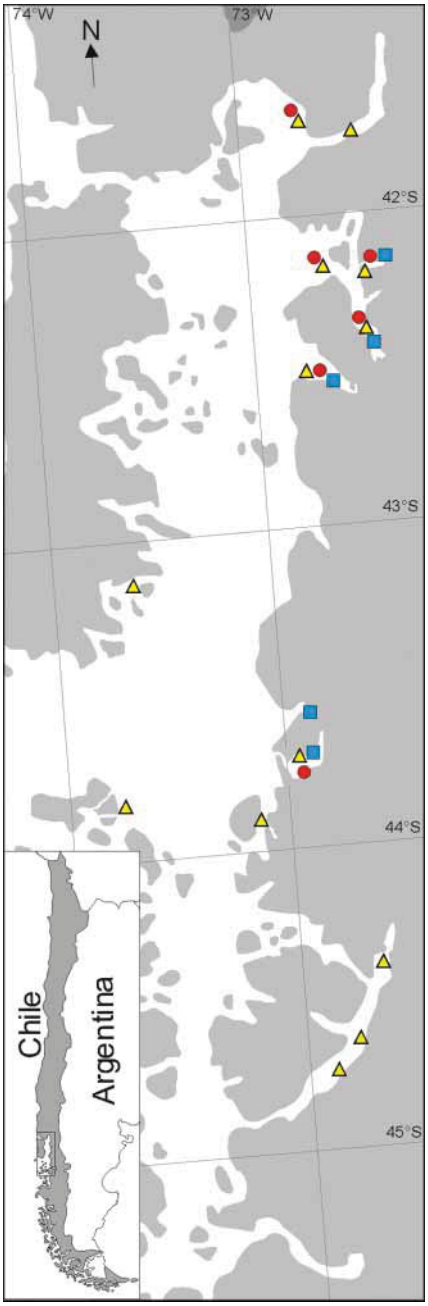

FIGURE 7. Sites in southern Chilean fjord region where corals were found. Triangles: *Desmophyllum dianthus*, circles: *Caryophyllia huinayensis*, squares: *Tethocyathus endesa*.

Legend: Seno de Reloncaví: Punta Chaica/Lenca (S1: 41°38'303"S, 72°40'116"W); Fiordo Comau: numerous localities including Lilihuapi Island at mouth of fjord (S2: 42°19'40"S; 72°27'04"W, 42°20'28"S; 72°26'54"W, 42°22'28"S; 72°25'42"W, 42°23'15"S; 72°27'38"W, 42°23'29"S; 72°27'27"W, 42°23'42"S; 72°25'12"W; 42°0,9'S, 72°36'W); Fiordo Quintupeu (S3: 42°09'35"S; 72°25'35"W, 42°09'36"S; 72°26'06"W); Fiordo Reñihue: several localities (S4: 42°2'46,6"S; 72°37'0,2"W, 42°33'S, 72°36'W, 42°33'12,7"S; 72°35'22,3"W, 42°33,494'S; 72°36,271'W); Isla Cailín/Quellón (S5: 43°09'02,1"S; 73°35'30,9"W); Fjord Pitipalena (S6: 43°47'09,1"S, 72°55'34,2"W); Bahía Santo Domingo (S7: 43°58'18,4"S, 73°07'00,6"W); Seno Ventisquero (S8: 44°23'34,5"S; 72°34'54,9"W, 44°31,608'S; 72°32,107'W); Canal Puhuhuapi (S9: 44°43'29,1"S; 72°41'24,2"W, 44°49', 72°52'W); Bahía TicToc: Puerto Escondido (S10: 43°37'01,8"S, 72°52'50,5"W); Estero de Reloncaví (S11), Melinka, Guaitecas Islands (S12: 43°53'S; 73°44'W).

Tissue always clear transparent, sometimes slightly whitish-grey; Pharynx in some individuals slightly orange. Spherulae distinct, whitish. Color appearance may vary due to endolithic algae.

Comparisons. —Of the four recent species of *Tethocyathus, T. endesa* is quite similar to *T. prahli* Lattig & Cairns, 2000, a species known from Cocos Island (Costa Rica), the Atlantic coast of Columbia, and off French Guiana (reported herein, USNM 100483), at depths of 267–333 m. *T. endesa* differs primarily in having a wide depression on the upper outer edges of their S1–2.

Etymology. —The species was named after the company ENDESA which promotes biodiversity research and conservation at the Huinay Scientific Field Station and with their donation to the BIOPAT program (www.biopat.de). As a coincidence, endeca is the Greek word for eleven, a septal symmetry that is often found in *T. endesa*.

Habitat and Biology. —In the Chilean fjords *Tethocyathus endesa* was found on primary and biogenic hard substratum including the shell of a giant barnacle (*Austromegabalanus psittacus*) and shells of dead and living sessile mollusks (e.g. *Crepidula* sp., *Aulacomya atra*) below 20 m. Single specimens were found as shallow as 15 m, but always below the influence of the low salinity layer. It can be found on surfaces with no to slight coverage of fine or soft sediment (e.g. faeces and pseudo-faeces of mytilids) that does not exceed 5 mm in thickness. In crevices, caverns and on boulders, *T. endesa* can always be found on the upright (upward directed) surfaces. In many cases only the oral disc and the tentacles protrude out of the soft sediment.

Off Concepcion an aggregation of *T. endesa* was found in a grab sample of hardened sediment taken by the research vessel *Kay-Kay* of the Universidad de Concepción. The sample was taken in 240 m depth from benthic communities in the center of the Oxygen Minumum Zone (OMZ) with oxygen concentrations that practically never exceed 0.5 ml/l. *Tethocyathus endesa* is the least common of the three coral species found in the upper infralitoral in the Chilean fjord region. This species was only found as isolated individuals or in small aggregations of less than 10 specimens but often in neighborhood of *Caryophyllia huinayensis* and *Desmophyllum dianthus*. Due to its low growth, broad base, and strong attachment it is very difficult to sample specimens of this species undamaged. Several specimens were observed to have larvae or eggs in the tentacles.

Associated species. —*Tethocyathus endesa* is regularly found on rocky surfaces that are covered by crustose red algae. In the shallow water habitat it is almost always found in close proximity to *Epizoanthus* sp., which is much more abundant. Its small size and its association with the similar *Epizoanthus* species, in combination with its strong similarity in appearance to the abundant corallimorpharian *Corynactis carnea*, with which it may share habitat, makes it easy to overlook. In crevices and caverns, *T.* endesa can be associated with *Caryophyllia huinayensis* and *Desmophyllum dianthus*, with the latter two species found on the vertical parts and in upside down positions close to the entrance whereas *T. endesa* generally inhabits the lower and inner portions in upright position. In many

light-exposed specimens of *T. endesa* endolithic algae stain the corallite pink or yellow-greenish.

Distribution. —Northern Patagonian fjord region: Fiordo Comau: numerous localities (S2); Fiordo Quintupeu (S3); Fiordo Reñihue (S4); Bahía TicToc: Puerto Escondido (S10); Fjord Pitipalena (S6); Bahía Santo Domingo (S7); off Concepción, Central Chile. 15–40 m (Chilean fjords), 240 m (off Concepción) (Fig. 7).

***Deltocyathus parvulus* Keller, 1982**

Fig. 2I

Deltocyathus parvulus Keller, 1982: 47–51, map 1, pl. 3 (misnumbered as second pl.1, captions to plates mixed), figs. 3–16 (not 17).

New Record. —*Anton Bruun* 17-674G, 24°24'S, 80°47'W, 4195 m, 11 July 1966, 1 damaged specimen, USNM 1021993.

Remarks. —One small (6.2 mm in CD) damaged specimen is reported from the abyssal plain off the Miriam Spur of the Nazca Ridge off northern Chile. It is characterized by having a strongly conical-shaped corallum, four cycles of septa, rudimentary S4, and tuberculate columellar elements. It was previously reported from the eastern Pacific from the abyssal plain of the Peru Basin off southern Peru at 4620 m (Keller 1982). It is also reputed to occur in the western Pacific at depths of 1940–5080 m (Keller 1982), making it the deepest living species of *Deltocyathus* as well as one of the deepest living scleractinian species.

***Desmophyllum dianthus* (Esper, 1794)**

Figs. 5A–E, 6F–H, 7

Madrepora dianthus Esper, 1794: pl. 69.

Desmophyllum cristagalli Milne Edwards & Haime, 1848: 253, pl. 7, figs. 10, 10a.. —Squires, 1969: 17, pl. 6, map 1. —Cairns, 1982: 29–30, pl. 8, figs. 9–12, pl. 9, figs. 1–3, map 6. —Stanley & Cairns, 1988: 236, figs. 2, 3A.

Desmophyllum cumingii Milne Edwards & Haime, 1848: 254, pl. 7, fig. 11.

Desmophyllum ingens Moseley, 1881: 160–162, pl. 4, figs. 1–6, pl. 5, figs. 1–4a. —Squires, 1969: 17, pl. 6, map 1.

Desmophyllum dianthus. —Cairns, 1995: 26–27, pl. 9a–d (description, synonymy). —Piñón, 1999: 20, 81. —Försterra & Häussermann, 2001: 155; 2003: 119–128, colour figs. 2–5 (20 sites in south Chilean fjords, 8–45 m). —Försterra et al., 2005: 937–977, colour figs. 2–5.

New Records. —Caleta Gonzalo (42°32'46.6"S, 72°37'00.2"W), Chile, 28 m, 23 Feb 2001, 1 specimen, USNM 1009656; Caleta Gonzalo, Chile, 35 m, 7 Feb 2001, 1 specimen, USNM 1009657; Lenca (41°38'20.4"S, 72°40'07.4"W), 27 m, 1 specimen, USNM 1009654; ship wreck close to Puyuhuapi, Chile, 24 m, 13 Feb 2001, 1 corallum, ZSM; Isla

Cailin, Chile, 8 m, 3 Feb 2001, 1 specimen, ZSM; Juan Fernandez Islands, Sector El Pangal, Bahia Cumberland, 4–5 m, March 1998, 1 specimen, IZUA-CNI-0070; Mouth Seno Baker (close to Tortel 47°49'S, 73°34'S since the Rio Baker is flowing in there), Chile, 300 m, MZUC-8133; Moyano Coll. 1-10-1972; Isla Inocentes, 150 m (50°33'S, 74°53'W); MZUC-8136; Moyano Coll. 9-10-1972; Isla Diego Ramírez, South Chile, 100 km S of Cape Horn, 1900 m, on antipatharian, Sept 2001, 1 specimen, IZUA-CNI-0019; Caleta Gonzalo, Reñihue Fjord (42°2'46,6"S, 72°37'0,2"W), Chile, 25–35 m, 23 Feb 1997, 2 pseudo-colonies, ZSM 20020240; Caleta Gonzalo, Reñihue Fjord (42°2'46,6"S, 72°37'0,2"W), Chile, 25–35 m, 23 Feb 2001, 2 pseudo-colonies, RMNH Coel. 32192; Punta Llonco, Comau Fjord (42°20'28"S, 72°26'54"W), Chile, 25–30 m, 6 Aug 2003, 2 pseudo-colonies, IZUA-CNI-0039 and 0040.

Distribution. —Chilean fjord region: Seno de Reloncaví: Punta Chaica/Lenca (S1); Fiordo Comau: numerous localities including Lilihuapi Island at the mouth (S2); Fiordo Quintupeu (S3); Fiordo Reñihue: several localities (S4); Isla Cailín/Quellón (S5); Fjord Pitipalena (S6); Bahía Santo Domingo (S7); Seno Ventisquero (S8); Canal Puhuhuapi (S9), Estero de Reloncaví (S11), Guaitecas Islands (S12), Mouth Seno Baker, Isla Inocentes, Isla Diego Ramirez; Juan Fernández Islands; 8–1900 m.

Remarks. —Moseley (1881) was the first to report *D. dianthus* (as *D. ingens*) from four localities off Chile between 48°S–53°S latitude at depths of 256–631 m. The only other reports of Chilean *D. dianthus* (as *D. cristagalli*) were those of Cairns (1982), consisting of 7 additional records from latitude 46°S–54°S and depths of 91–821 m, as well as from a seamount on the Chile Rise (*Eltanin* 326), and specimens reported by Försterra and Häussermann (2003) and Försterra et al. (2005) from the Chilean fjord region (8–45 m), further documented herein. Cairns (1982) and later Stanley & Cairns (1988) suggested that quasicolonial *D. ingens* was so abundant at certain stations that it probably served as the foundation species for deep-sea coral banks. The specimens reported herein extend the known distribution to 41°S at the remarkably shallow depth of 8 m. *D. dianthus* is a cosmopolitan species, the previous depth range known for it being 25–2460 m, the shallow range from New Zealand fjords (Cairns 1995). The shallow-water Chilean specimens are of the "*ingens"* form of the species, consisting of quasicolonial coralla up to a record length of 40 cm (Försterra & Häussermann 2003), and having a thin theca and widely-spaced dissepiments, which results in a very low density corallum. The larger specimens have a sixth cycle of septa arranged: S1–3>S4>S5>S6.

The extreme morphological differences between specimens of *Desmophyllum dianthus*, cosmopolitan distribution and the extremely different habitats and ecological niches that this species inhabits make it imaginable that we are dealing with several species or subspecies that show a morphological continuum. Molecular studies might help to resolve this question (Fukami et. al. 2004).

Polyp morphology. —In general only the most apical portion of the corallite is covered with polyp tissue. Tissue color of lips and tentacles can vary from almost clear transparent

over white to bright orange-red; tissue of the oral disc is generally clear transparent; pinkish, yellow or greenish appearance results from endolithic algae. Pharynx in some individuals with longitudinal orange stripes. Spherulae only slightly pronounced, whitish.

Growth forms and rates. —Specimens in shallow water show variability in growth form. Solitary specimens, specimens in loose aggregations, and coralla at the border of dense aggregations show short, massive and trumpet-shaped corallites with ratios of PD:GCD of generally less than 1:2. In these specimens, at least the primary septa are prominent and project beyond the border of the cup. Specimens within dense aggregations are generally pseudo-ramified, with elongated, delicate, cylindrical corallites of up to 400 mm long, with the CD rarely exceeding the diameter of the pedicel. In these specimens, the septa do not or hardly exceed the calice border. The latter growth form is probably caused by intraspecific competition for a position of the polyp exposed to current. Closely neighbored corals often partially fuse and elongated specimens often exhibit "adventive roots" which reinforce the frequently slender base. On vertical and near-vertical walls, and at sites with higher sedimentation, specimens of *D. dianthus* show a downward bending growth. In Chilean fjords below 20 m, specimens of *D. dianthus* may form dense aggregations that have been observed to cover more than 1000 m^2. Especially under overhangs these aggregations can obtain a three dimensional structure through extensive growth of a single individual and pseudo-branching, which can include up to five generations. Here population densities may exceed 1500 individual per m^2. Specimens on the fibre hull of a boat wreck in 22 m depth, Seno Ventisquero (S 8), allowed for minimum growth rate estimations: the largest specimens measured 21 mm in height and 15 mm in diameter. Taking into account the time of the boat accident, the maximum age of these specimens must have been less than 9 years with resulting maximum growth rates of 2.3 mm/yr length growth and approx. 1.6 mm/yr diameter growth. These growth rates of young individuals are considerably higher than those estimated for deep Atlantic specimens (Risk et al. 2002).

Habitat. —During our diving surveys we found this species on primary (rock walls, boulder ground, fibre ship hull) and biogenic hard substratum (mussel shells) where the slope exceeds approx. 80° with moderate to strong currents exposure during tide changes. We regularly found this species in the euphotic zone between 20 and 45 m depths; single specimens can be found as shallow as 8 m (S5, S2), but always below the regular influence of the low salinity layer. The largest and most shallow accumulations of these corals were found in the fjords, particularly in the fjords Comau (including fjord Quintupeu and Lilihuapi Island) and Reñihue (S2–4). Habitat temperatures ranged from 8 to 13.5 °C and salinities from 28.5 to 34 ‰. ROV observations showed similar structured, partly very large coral banks down to 250 m. At these depths some of the corallites showed a brown cover which probably consists of iron/manganese compounds which indicates anoxic conditions.

Associated species. —We regularly found specimens with corallites stained by endolithic algae which give them a pinkish, yellow-brown, olive or greenish appearance. The

endolithic algae seem to be restricted to the portion of the corallite that is still covered with polyp tissue. This might indicate a more than just a commensal relationship (Försterra et al. 2005). Pinkish staining is restricted to the more light exposed side of the corallite. *Desmophyllum dianthus* was regularly associated with calcified and non-calcified crustose red algae (probably genus *Lithothamnium* or *Lithophyllum*) which can cover the substratum around the corallites, but were never observed to cover the corallite itself. Further common species that share the habitat with *D. dianthus* are the serpulid polychaete *Apomatus* sp., the sponges *Geodia magellani, Mycale thielei* and *Iophon* sp., the bryozoan *Cellaria malvinensis*, the gastropod *Crepidula* sp. and the coral *Caryophyllia huinayensis* which may grow between as well as on specimens of *D. dianthus*. In depths greater than 100 m *D. dianthus* is associated with giant clams of the genus *Acesta*. The proximal portion of the corallite that is not covered by polyp tissue, in many specimens is densely covered with epizoic organisms of various taxonomic groups. Close to coral banks we often observed large schools of the scorpaenid fish *Sebastes capensis* with especially the younger specimens hiding between the corals when disturbed. In exposed, not overhanging portions which are not suitable for *D. dianthus*, the sea anemone *Actinostola chilensis* is regularly found in vicinity to coral banks (Häussermann, 2005). An important number of specimens show perforations in the proximal portion, mainly caused by sabellid polychaetes and boring sponges of the genus *Cliona*.

Specimens from Juan Fernandez Island were collected in 4–5 m depths in small rocky caves.

Mortality and coral rubble. — Epizoic load, especially through other corallites of the same species, and elongated fragile growth in combination with erosive work of perforating organisms can cause older corallites to brake off. On vertical walls, further corals can break off when hit by a falling pseudo-colony causing a domino effect. As a consequence, accumulations of coral rubble can be found on terraces below coral banks, with the uppermost individuals generally still being alive.

In the shallow water of the fjords *Desmophyllum dianthus* is mainly nocturnal.

In the fjords, this species can generally be found on overhanging portions of the substrate where it generally dominates the benthos below 20 m. Only at sites with low or moderate sedimentation and moderate to strong tidal currents less dense accumulations can be found on near vertical to vertical substrate, where they generally show downward bending growth. These facts imply high sensitivity towards sedimentation stress. An increment of sediment stress caused by salmon and mussel farms might represent a serious threat to these unique shallow water coral communities (Försterra & Häussermann 2003). In this context the association with the fish species *Sebastes capensis* might represent a mutualistic symbiosis. The fish has been observed to use the spaces between corallites in denser coral accumulations as safe hiding places whereas the corals might benefit from being cleaned from covering sediment through the sweeping effect of the fish movements.

Solenosmilia variabilis Duncan, 1873

Fig. 2J

Solenosmilia variabilis Duncan, 1873: 328, pl. 42, figs. 11–18. —Squires, 1969: 18, pl.6, map 2. —Cairns, 1982: 31, pl. 9, figs. 4–5 (Subantarctic records, description, synonymy, figures); 1995: 82, pl. 23d–e (synonymy).

New Record. —*Vema* 17-14RD, 47°01'S, 75°44'W (off Península Tres Montes), 1146 m, 1 colony, USNM 1022415.

Remarks. —The only previous record of this species from Chile or the entire eastern Pacific was that of Squires (1969), who mapped one occurrence at about 47° S but did not provide documentation. The *Vema* specimen reported herein is undoubtedly that record. It is a small colony of 6 cm in height having only 12 corallites, but shows evidence of intratentacular budding, which is characteristic of the genus, leading to equal, three-dimensional dichotomous branching.

Solenosmilia variabilis is one of the few scleractinian species having an almost cosmopolitan distribution, occurring at depths of 220–2165 m (Cairns 1995).

Sphenotrochus gardineri Squires, 1961

Sphenotrochus intermedius. —Gardiner, 1939: 333 (in part: *Discovery II* 388).
Sphenotrochus gardineri Squires, 1961: 26–28, 30, figs. 6–8; 1969: 17, pl. 6, map 1. —Cairns, 1982: 26, pl. 8, figs. 2–8. —Piñón, 1999: 20, 82 (listed).

Remarks. —This species was first reported from Chile off Cape Horn by Gardiner (1939) as *S. intermedius*. One additional record was first mapped (Squires 1969) and later verified by Cairns (1982) from Isla Guafo, both records occurring in relatively shallow water: 121–152 m. The species is also known to occur off Tierra del Fuego at depths of 9–403 m (Cairns 1982). No additional records are known.

Flabellum (F.) curvatum Moseley, 1881

Flabellum (F.) curvatum Moseley, 1881: 174–175, pl. 6, figs. 3a–d. —Cairns, 1982: 35–38, pl. 10, figs. 10–11, pl. 11, figs. 6–9, map 9.

New Record. —*Akebono Maru* 72–85, 55°01.7'S, 72°27.2'W, 275 m, 18 Nov 1978, 1 corallum, MNHNS.

Remarks. —*Flabellum curvatum* is known off Chile from only two records from the Drake Passage off Cape Horn (406–1137 m) reported by Cairns (1982), and off Isla Stewart (275 m, 55°S) reported herein. Like *B. malouinensis*, its primary distribution is off

southeastern South America from Rio de la Plata to Cape Horn, Falkland Islands and South Georgia at depths of 115–1097 m. It is distinguished from *F. apertum* by having a smooth calicular edge and a bent or curved pedicel.

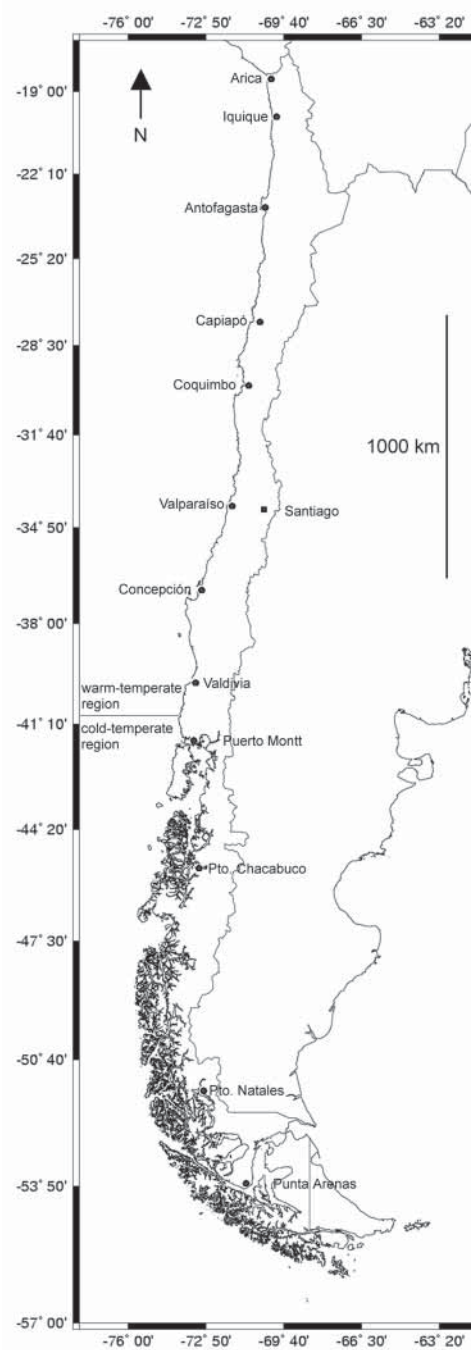

FIGURE 8. Map of Chile with major cities and zoogeographical regions *sensu* Briggs (1974).

Flabellum (U.) apertum Moseley, 1876

Flabellum apertum Moseley, 1876: 556. —Cairns, 1982: 44–46, pl. 13, figs. 8–11, pl. 14, figs. 1–4. —Piñón, 1999: 21, 82 (listed).
Flabellum patagonichum Moseley, 1881: 166–167, pl. 15, figs. 1–7. —Squires, 1969: 17, 18, pl. 6, map 4.

New Records. —*Anton Bruun* 18A-687, 34°07'S, 72°19'W, 730–750 m, 5 Aug 1966, 1 dead specimen, USNM 1021995; *Akebono Maru* 72–27, 52°48.7'S, 52°50.3'W, 317 m, 11 Nov 1978, 3 coralla, USNM 80376; *Akebono Maru* 72–49, 53°44.4'S, 53°46.3'W, 482 m, 14 Nov 1978, 1 corallum, USNM 80377; *Akebono Maru* 72–86, 55°04.4'S, 72°10.0'W, 193 m, 18 Nov 1978, 2 coralla, MNHNS; *Akebono Maru* 72-116, 56°05.2'S, 70°02.6'W, 435 m, 23 Nov 1978, 10 coralla, MNHNS.

Remarks. —*Flabellum apertum* was first reported (Moseley 1881) from off Chile (48°S, Golfo de Penas) as *F. patagonichum* at 220 m. Cairns (1982) later reported two records from the continental slope off Isla Desolación (1262–1500 m). Specimens reported herein were also collected off Isla Desolación, off Islas Morton, and a northern range extension at 34°S. The species is thus known from 34° to 56°S off the Chilean coast at depths of 193–1500 m but is more widespread throughout the Subantarctic at similar depths (Cairns 1982, 1995). It is well described and illustrated by Cairns (1982, 1995).

Truncatoflabellum truncum (Cairns, 1982)

Flabellum truncum Cairns, 1982: 46, pl. 14, figs. 5–8. —Piñón, 1999: 21, 82 (listed).
Truncatoflabellum truncum. —Cairns, Hoeksema & van der Land, 1999: 32 (listed).

Remarks. —This species has been reported only by Cairns (1982) from the continental slope off Isla Desolación (type locality) and off Taltal, Chile (25°–53°S, 950–1896 m), as well as off Peru (8°S) and the Falkland Plateau (as shallow as 595 m). It is easily recognized by having a basal scar from which it asexually detaches from an attached anthocaulus. Cairns (1989: Table 6) implied that *T. truncum* was a junior synonym of *T. trapezoideum* Keller, 1981, the latter known only from the Marcus Necker Ridge at 1630 m, but Cairns et al. (1999) listed them as separate species. Both species are poorly known and should be closely compared when more specimens are available.

Javania cailleti (Duchassaing and Michelotti, 1864)

Desmophyllum cailetti Duchassaing and Michelotti, 1864: 66, pl. 8, fig. 11.
Desmophyllum eburneum Moseley, 1881: 162, pl. 6, figs. 1a–b.
Javania cailetti. —Cairns, 1982: 46–47, pl. 14, figs. 9–12, map 12; 1995: 29–30, pl. 10g–i (description, synonymy). —Piñón, 1999: 21, 82 (listed).

Remarks. —This species has been reported only twice from Chile (Moseley 1881, Cairns 1982), both records from Canal Mesier, southern Chile (48°27'S: type locality of *D. eburneum*) at depths of 627–821 m. It is one of approximately a dozen cosmopolitan deep-water scleractinian species, and ranges from 86 to 2165 m (Cairns 1994). It has been described and illustrated by Cairns (1979, 1982, 1994).

Balanophyllia malouinensis Squires, 1961

Balanophyllia malouinensis Squires, 1961: 15, 19, 40, 46, figs. 5, 24–26; 1969: 17, 18, pl. 6, map 4. —Cairns, 1982: 52–54, pl. 16, figs. 4–7, pl. 17, figs. 1–3, pl. 18, fig. 7, map 13.

New Records. —*Akebono Maru* 72-34, 53°12.0'S, 74°51.6'W, 396 m, 12 Nov 1978, 4 coralla, MNHNS; *Akebono Maru* 72-90, 55°06.2'S,71°58.7'W, 132 m, 19 Nov 1978, 3 coralla, MNHNS.

Remarks. —Squires (1969) was the first to indicate this species occurring in Chile, from the Drake Passage off Cape Horn, these three records later documented by Cairns (1982) from 494–1137 m. Specimens reported herein extend the Chilean distribution farther northward to off Isla Desolación (53°S) and to a depth of 132 m. The main distribution of this species is off Venezuela Tierra del Fuego, the Falkland Islands, and South Georgia at depths of 75–780 m (Cairns 1982). It is unique among the Chilean coral fauna as being the only known dendrophylliid species. It is described and illustrated by Cairns (1982).

Acknowledgments

We gratefully acknowledge the assistance of Helmut Zibrowius regarding literature references, confirmation of the *Akebono Maru* identifications, and making additional specimens available for study. We want to thank the following colleagues for making available coral specimens for identification: Alejandro Bravo for corals of the museum of the Universidad Austral de Chile, Javier Sellanes y Victor Ariel Gallardo for the corals dredged with the Kay-Kay off Concepción, Luis Prado for the *Desmophyllum dianthus* from Juán Fernández Islands, and Francisco Bravo for the *Bathycyathus chilensis* from Juán Fernández Islands. Many thanks to Eduardo Hajdu and Mariana Carvalho for identification of associates sponges, to Hugo Moyano for identification of the associated bryozoan and to Nicolás Rozbaczylo for identification of the associated polychaete. Many thanks to Matthias Gorny (Litoral Austral) and the crew of the research vessel Don Este for their efforts during the ROV operation. This is publication number 6 of the Huinay Scientific Field Station.

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